



# Nailing Digital Jelly to a Virtual Tree

## Tracking Emerging Technologies for Learning

**T**ry to balance Arthur C. Clarke's observation that "any sufficiently advanced technology is indistinguishable from magic" with the idea that "if it's shipping, it's already obsolete," and you'll begin to feel the pain of education leaders confronted with choices about emerging technologies. Which investments are worth the time, money, and effort required in the quest to improve student learning and achievement?

Reliable information on emerging technologies is as vital as it is difficult to come by. To meet this need, ISTE organized the Emerging Technologies (ET) Task Force, which we co-chair.

Our goal is to create a database of contributions from educators highlighting their use of emerging technologies to support teaching and learning. To make this useful for everyone, the collection level of data is deep. The database is online, and the demographics that are collected include grade level, size of district, and type of network connections to allow users to search for an emerging technology that might work in their circumstances. Participants will explore what has been learned so far in each context, and will also begin to prioritize their needs and link up with other contributors to the database who share similar challenges and/or resources. In this article, we share with you what has been discovered thus far.

By Ferdi Serim  
and Kathy Schrock



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### Defining the Virtual Tree

What is an emerging technology? If it's out of the engineering lab, but not yet widely in use or widely known, we consider it an emerging technology, recognizing that what is emerging for one school may be commonplace for another. However, the key is it must be in use, so that the learning it makes possible may be replicated by others.

Although life at the bleeding edge may look different depending on where you sit on the technology development spectrum, certain fundamentals emerge with regard to how learning is improved through the use of emerging technologies:

1. Any educational technology (emerging or otherwise) can only deliver its potential benefits if the whole system allows that to happen.
2. Any student learning that is not explicitly designed to provide opportunities and supports for mastery of 21<sup>st</sup>-century skills is not likely to produce these results accidentally or by coincidence.
3. Only through careful, thoughtful, and effective planning can people, resources, and ideas be aligned to allow all learners (students, educators, parents, and community) to develop the skills and knowledge they require to thrive in the 21<sup>st</sup> century.

Therefore, the trunk of our virtual tree has three branches: Organizational Capacity, Process Management, and Operational Capacity.

**Organizational Capacity** includes human resources needed and professional development ideas employed to use emerging technologies effectively.

**Process Management** contains the tools used to directly support teaching and learning, including information literacy tools, productivity and creation tools, learning management systems, and instructional media tools.

**Operational Capacity** refers to all the other items that make it work, including network security, data management, and the huge area of infrastructure management.

Any example of ed tech can show up in one or more of these categories, so we report on its contributions to each context. For example, the iSkills Assessment of ICT Literacy plays a role in shaping instruction as well as professional development, so it appears in both Process Management and Organizational Capacity categories.

### Nailing the Digital Jelly

The most obvious challenge in keeping current with the shape-shifting technologies coming into view is understanding how they can be used to improve learning. Hundreds of our U.S. colleagues have already contributed to the database, and we also review reports by other groups working in this field. Among the most useful are the annual Horizon Reports on emerging technologies produced by the New Media Consortium and the Educause Learning Initiative. Although the reports identify trends for higher education, they are also relevant to K–12. These trends predict adoption of these technologies to happen in the following time frames:

- Time-to-Adoption: One Year or Less
  - ♦ Social Computing
  - ♦ Social Networking
  - ♦ Personal Broadcasting
  - ♦ User-Created Content
- Time-to-Adoption: Two to Three Years
  - ♦ mLearning: The Phones in Their Pockets
  - ♦ Virtual Worlds
  - ♦ Educational Gaming
- Time-to-Adoption: Four to Five Years
  - ♦ Augmented Reality and Enhanced Visualization
  - ♦ Context-Aware Environments and Devices
  - ♦ The New Scholarship and Emerging Forms of Publication
  - ♦ Massively Multiplayer Educational Gaming

The Horizon Project 2007 wiki includes student insights. Here are summaries and excerpts from what they have to say:

**User-Generated Content:** Predictions that people would change from consumers to producers of information have come true with Web



2.0 technologies. “Users can now create their own content online and download as well. These contributors are now finding new ways to contribute, communicate, and collaborate using a variety of tools, including Google docs, social networking sites, blogging, and social book-marking sites such as Flickr and del.icio.us.”

**Social Networking:** People crave connection. “Increasingly, this is the reason students log on...the heart of social networking is fostering the kinds of deep connections that occur when common pursuits are shared and discussed,” according to Kristina Woolsey in the Horizon 2007 Report. “Social networking offers a way for people to connect from their desktop, cell phone, personal digital assistant, laptop, or any other electronic device to people all over the world. Social networking Web sites have taken society by storm and created quite a stir: a good stir, a negative stir, and a questioning stir. The important things currently are the implementing of Internet safety, the distribution of awareness, the differentiation between the benefits and drawbacks, and the harnessing of its potential in all areas of life.”

**Mobile Phones:** The talking function of a mobile phone is no longer its dominant usage, and textual and visual communications as well as uses of Web resources and applications (online and local) are fast becoming central functions of modern mobile communication. Mobile phones and mobile learning will allow students to learn anytime, anywhere, and with any media.

**Virtual Worlds:** Virtual worlds hold significant potential for a learner-led—rather than an outcome-based—model of exploration and knowledge development.

Using virtual worlds for education has significant potential to foster constructivist learning, putting students in contact with others in an immersive environment that challenges them to figure things out for themselves, without explicit learning objectives and assessment.

Virtual worlds often facilitate “unintentional” learning, where students discover and create knowledge not for its own sake but in order to accomplish something they want to do, resulting in stronger comprehension and deeper knowledge.

On a practical level, the smooth operation of virtual worlds requires robust hardware and fast Internet connections. With steep technology requirements also comes a greater burden on support staff to ensure the infrastructure can handle user demands.

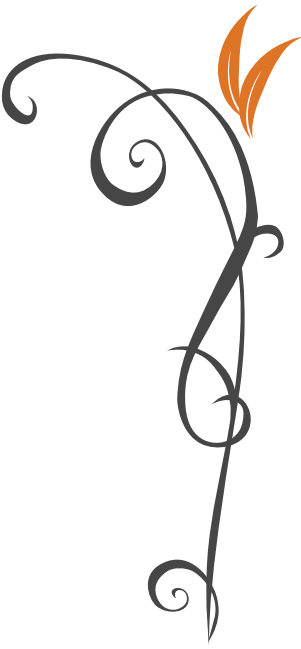
**New Scholarship and Emerging Forms of Publication:** Several emerging forms of publication are available. Many schools, authors, and teachers are changing the way they teach and publicize. In schools, new forms of publication and digital learning have made learning more interactive, and this has had a greater effect on students. In addition to new forms of publication, new forms of scholarship are also emerging. Several schools and classrooms are using the computer to teach and share information. Blogs, wikis, videos, and podcasts are the most commonly used forms of scholarship in a cutting-edge school. Some blogging scholars say that the forum for airing ideas and receiving comments from their colleagues helps them to hone their thinking and explore avenues they might otherwise have overlooked.”

**Massively Multiplayer Educational Gaming (MMEG):** A Tamil school started to use MMEG




#### About the ET Task Force

ISTE's Emerging Technologies Task Force will increase the educational community's knowledge and understanding of effective infusion of new and emerging technologies to support teaching and learning. We are building an interactive online database of best practices from the ed tech community that have shown positive effects on learning through the use of emerging technologies. To make this useful for everyone, the collection level of data is deep, correlating successful uses of emerging technologies with demographics that include grade level, size of district, and infrastructure, to allow users to search for an emerging technology that might work in their circumstances, too. The goal is to provide searchable ideas and information about emerging technologies for all grade levels, school sizes, and budgetary considerations, so we can learn from each other's successes. The ET Task Force does its work online, at NECC, and at regional meetings and conferences to ensure the widest possible participation. Kathy Schrock and Ferdi Serim co-chair the group.



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as a part of their curriculum. Their most effective MMEG is for their language program, to help the students learn the Tamil language. The whole class gets into the game at the same time, and they interact with each other through the game to increase their oral and vocabulary skills. Beyond language, there are games for other subjects, including physics, business studies, and so on. Since introducing this program six months ago, the school has seen a slight improvement in results because the students seem to be more interested in what they are studying, are enjoying this program, and think that if they continue with this program they will do well in school, because they seem to be learning a lot.

### Emerging Technologies Deserving Wider Recognition

Although the following four examples of emerging technologies were not included in the Horizon Report, they also should be on the radar of education leaders everywhere.

**Supercomputing:** The real work of science is being done in supercomputing environments. Fifteen years ago, very few teachers and students had even heard of the Internet, and now it is a “must have” for every classroom. Teachers and students today are similarly disconnected from the notion of supercomputers and what they can do to connect real science with classrooms. Consider this—historically, whatever supercomputers can do today will be on your desktop in 10–15 years. The students we have today will be called upon to work in this environment. It only makes good educational sense to incorporate these concepts and experiences into classroom practice as much as possible right now.

What is supercomputing? If you seek a definition, don’t blink! Supercomputing is the biggest, fastest computing right this minute. Likewise, a supercomputer is one of the biggest, fastest computers right this minute. So, the definition of supercomputing is constantly changing. As a rule of thumb, a supercomputer is typically at least 100 times as powerful as a personal computer.

What is supercomputing used for? Simulation of physical phenomena such as weather forecasting, galaxy formation, oil reservoir management, or data mining; finding needles of information

in a haystack of data, such as for gene sequencing, signal processing, or detecting storms that could produce tornados; and visualization—turning a vast sea of data into pictures a scientist can understand.


**iSkills Technology Assessment:** What is ICT Literacy and how do we assess it? Information and Communication Technology literacy is the ability to use digital technology, communication tools, and networks appropriately to solve information problems in order to function in an information society. ICT literacy includes the ability to use technology as a tool to research, organize, evaluate, and communicate information, and the possession of a fundamental understanding of the ethical and legal issues surrounding the access and use of information.

More simply, this means using cognitive and critical thinking skills in a technological environment to define, access, evaluate, manage, integrate, create, and communicate information. The iSkills assessment uses technology to allow students to demonstrate their proficiency in each of the seven areas.

**Convergence:** Convergence is the integration of the communications and computing resources and services that seamlessly traverse multiple infrastructures and deliver content to multiple platforms or appliances. Convergence has three levels: infrastructure, appliances, and services. All three work together, with the ultimate goal of allowing access to—and the delivery of—any service to any appliance, to and from anywhere, and over any medium, whether wired or wireless, or mobile cellular devices.

Convergence provides new opportunities to deliver education by focusing on technologies such as podcasting, videoconferencing, online collaboration, multimedia service delivery, video-on-demand, and integration of Wi-Fi with cellular. New or enhanced services include interactive distance education, collaborative instruction, international interaction (particularly for foreign languages), streaming foreign-language video, remote access to college and university media collections, and new educational content development.





**Network Quality of Service:** Packet-shaping—that tried-and-true method of prioritizing classes of network traffic and essentially giving some applications preferential treatment at the expense of others—has been used and relied on by IT departments for years. The standard rationalization that packet-shaping is used mainly for “non-educational” computing won’t hold when the potential benefits of Web 2.0 applications become more widely adopted in educational settings.

### Join Us!

We have found the impossible task of nailing digital jelly to a virtual tree to be exhilarating, exhausting, and essential. Beyond learning about “the best of things to come,” we get to work with many of the most innovative colleagues in our profession, who are nailing down these benefits for learners everywhere, every day. Please join us by working with us on ISTE’s Emerging Technologies project!

### Resources

Convergence Is Real: <http://connect.educause.edu/>

library/abstract/ConvergenceIsReal/40694

Horizon Project 2007 wiki: <http://horizonproject.wikispaces.com>

Horizon Reports: <http://www.nmc.org/horizon>

iSkills (formerly the ETS ICT Literacy Assessment): <http://www.ets.org/ictliteracy/>

ISTE’s ET Idea Library: <http://www.iste.org/emerging>

Of Gladiators and Bandwidth Realities: <http://connect.educause.edu/library/abstract/OfGladiatorsandBandw/44602>

Supercomputing in Plain English: <http://www.oscer.ou.edu/education.php>



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